Identifying Non-Technical Skills behavioural markers in rail controller and maintenance roles

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SUMMARY

This paper discusses the use of task observations, semi-structured interviews and thematic analysis to identify and classify Non-Technical Skills (NTS) behavioural data in rail controller and rolling stock maintenance roles. A human-centred design process was applied to develop materials to support rail organisations with observing, evaluating and developing NTS in rail controller and rolling stock maintenance roles. Wider factors influencing human performance in these roles were also identified and are discussed in this paper.

KEYWORDS

Non-technical skills; competence; rail

Introduction

Non-technical skills (NTS) are "the cognitive, social, and personal resource skills that complement technical skills, and contribute to safe and efficient task performance" and have been investigated in a range of high-risk industries (Flin, 2008). Research by RSSB produced an NTS framework and an accompanying set of behavioural markers for the train driver role (RSSB, 2012). However, a rail industry consultation found that NTS integration is varied across organisations and across rail safety-critical roles, partly due to a limited understanding of what NTS look like in non-driver roles (RSSB, 2022). The objectives of this research were to identify and classify NTS behaviours and strategies for rail controllers and rolling stock maintenance staff, and to develop human-centred NTS materials to support the observation, development and measurement of NTS in these roles.

Method

Data collection

The rail industry consultation indicated gaps in knowledge about how NTS are applied in practice in non-driver roles (RSSB, 2022), so this research sought to examine a range of tasks in the field to observe and identify NTS behaviours and strategies for rail controllers and rolling stock maintenance staff. This approach is slightly different to that of a typical Risk-Based Training Needs Analysis (RBTNA). For example, the RSSB RBTNA is used, in part, to deconstruct all tasks undertaken in a role and then map NTS – taken from the RSSB NTS framework – to these tasks. This is essentially about mapping a pre-existing NTS framework to tasks, whereas the current research looked to uncover NTS behaviours and strategies that could then be used to refine and enhance the existing NTS framework. As such. a selection of tasks was instead identified with the focus on uncovering NTS behaviours and strategies as opposed to mapping existing ones to a given task. The tasks in scope for each role were identified and prioritised via task analyses. Existing RBTNAs produced by participating organisations were also used to determine the tasks in scope, to help ensure a range of behaviours could be discovered.

Site visits were undertaken at three railway control rooms, covering a passenger train operator, a freight train operator, and Network Rail. Site visits were undertaken at four rolling stock maintenance depots, covering a passenger train operator, two freight operating companies, a rolling stock manufacturer.

The researchers captured behavioural data while observing front line staff undertaking tasks (n=8 for control; n=10 for maintenance). Observations were structured around the Human Information Processing Model. Semi-structured interviews were carried out with subject matter experts, using critical incident technique questions (front line staff, assessors, instructors and front-line managers; n=13 for control; n=15 for maintenance). The interview schedule and observations were designed to elicit information on *how* staff carry out their tasks and to identify behaviours and strategies that help them perform tasks well.

Data analysis

Thematic analysis was used to code and combine the behavioural data, creating sets of behavioural statements for each of the roles. These statements were then categorised and refined using the RSSB NTS framework of seven NTS categories and 26 skills as well as the behavioural markers developed for the train driver role (RSSB, 2012).

Design of NTS materials

The NTS data were used to create resources to support the observation, measurement and development of NTS in rail controller and rolling stock maintenance staff. Structured questions were used to gather feedback from intended end users and refine the materials (front line staff, trainers, assessors and operational front line managers; n=6 for control; n=4 for maintenance).

The NTS materials

For each role, three resources were produced to support the integration of NTS.

NTS task examples: For each of the 26 skills, this provides a non-exhaustive list of example behaviours and associated front line tasks that demonstrate these skills. It illustrates what NTS looks like when completing rail controller and rolling stock maintenance staff tasks.

NTS behavioural descriptions: For each of the 26 skills, this provides a description of positive NTS behaviours that rail controller and rolling stock maintenance staff demonstrate to support safe and efficient performance. It is design to support organisations in integrating NTS into competence management systems, including training and assessments.

NTS strategies: This presents specific techniques that rail controller and rolling stock maintenance staff use to apply NTS. These aim to help front line staff understand and choose practical things they can do to apply NTS, and help managers to support front line staff NTS development.

Wider Human Factors considerations

Data collected also identified organisation and job/workplace factors which affected human performance in rail controller and rolling stock maintenance staff. In maintenance, enablers included: using task or job rotation to reduce the repetitiveness of the work (which can lead to complacency or things being missed) and allocating sufficient time to the completion of maintenance tasks to encourage staff not to rush tasks. In control, enablers included: using phones with instant replay to allow any missed details to be picked up after a call has ended and upskilling controllers on different routes so they can support each other when workload becomes too high. Rail organisations should address such factors when seeking to improve human performance, and not focus on NTS alone.

References

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